



QUESTION | I HAVE A CLIENT WHO HAS RECENTLY BEEN DIAGNOSED WITH A FEMORAL NECK STRESS FRACTURE. SHE HAS A COMPLEX HISTORY OF TRAUMA BUT NOTHING WITHIN THE PAST 14 MONTHS. SHE IS WORRIED THAT IT WAS CAUSED BY A GLUTE MACHINE IN THE GYM. SHE HAD NOT RECENTLY INCREASED HER LOADING ON THIS PIECE OF EQUIPMENT. I WAS WONDERING, IN ISOLATION, COULD THIS EXERCISE BE THE PRIMARY CAUSE OF A FEMORAL STRESS FRACTURE.

ANSWER| Thank you for your question concerning the development of a femoral neck stress fracture. It is unlikely that this exercise was the primary cause of her stress fracture, but it is possible.

A femoral neck stress fracture (FNSF) is a nasty injury, often requiring months until the patient may return to pre-injury training levels. Once diagnosed you must consider telling your patient that “this may be the worst sports injury you will ever have”. This may seem negative but is realistic and reduces the risk of the patient taking a ‘short cut’ to return to impact sports.

Epidemiology and Pain

Stress fractures are common, comprising of up to 15% of lower limb overuse injuries. Of these 5% occur at the femoral neck. As with most bone stress injuries the onset is usually insidious, aggravated by physical activity. FNSFs present with pain which is usually anterior often with associated pain on active flexion and possibly resisted flexion. Thigh and buttock pain is possible but far less common. The pain may be sharp with sudden impact although night pain is less common.

History, Causation and Bone Health

The history is very important. Be alert to a history of increasing impact training, including interval (fartlek) training. One recent healthy 20 year old female had increased her speed training on the treadmill – she was running 10 sets of 30 secs sprints on top of her normal training - this seemed to be the only risk factor change which precipitated the development of her groin pain and subsequent diagnosis of a moderate grade FNSF. Enquire of a past history of previous overuse injuries, previous pelvic injuries and also bone health. Previous injuries leading to weakness, limb shortening and reduced hip range of motion are relevant with bone stress.¹

On impact, the load of body weight is transmitted down the lower extremities and may exceed 3-5 times the body weight in the femoral neck during running. Muscular absorption of forces distribute load, especially the gluteus medius. Thus these forces accompanied with weakness are relevant in the prognosis and management of the stress fracture.

Bone health should be approached in terms of any family history of osteopenia or osteoporosis, dietary abnormalities (including a history of eating disorders) and menstrual abnormalities (amenorrhoea or oligomenorrhoea). Rapid return to weight bearing activity following child-birth may be a risk factor although this is not conclusive. Twenty years ago there was no clear causal relationship between bone health and bone stress but the data is now compelling.² Vitamin D deficiency and the use of certain medications such as oral corticosteroids also carry an associated risk.³

Examination features

There may be little to find on clinical examination. An antalgic gait, evidence of previous injuries or biomechanical abnormalities must be observed. Passive hip motion is often comfortable unless there is advanced pathology. Pain in the extremes of hip ROM is then displayed. Log-rolling the leg may be painful. If so avoid the single leg hop test!

Site of pathology and diagnosis

The diagnosis is a clinical one, but imaging is usually required. This assists to categorise the injury in terms of site and severity. A classification system and treatment plan may be based on 3 categories of these fractures:

- infero-medially, or the compression side, which are the most common,
- supero-laterally or the tension side, and
- displaced femoral neck fracture.⁴

As the blood supply to the femoral head runs through the neck of femur, a FNSF with displacement may cause avascular necrosis of the femoral head. If the diagnosis is delayed an immediate surgical opinion may be required.⁵

Imaging should always commence with a plain X-ray with weight bearing films, AP films and frog-views. Bone stress is evidenced on plain films in less than 10% of patients, but sclerotic areas or fracture lines may be noted. MRI is accurate for bone stress and has many advantages over nuclear imaging (bone scans) such as reduced radiation. Costs will vary. An MRI never should be performed in lieu of a plain Xray. The typical findings on MRI are of periosteal and marrow oedema and a fracture is sometimes seen with a chronic lesion or as an acute episode. CT scan with 3-Dimensional Imaging is helpful to visualise fractures more clearly if surgery is being considered.

Management

Please note a detailed review of stress fracture management will be published in a subsequent Question to Physiotherapists.

As with any stress fractures the principles are similar. Analgesia as needed with restriction from the aggravating activity. Crutches may be required. Most stress fractures will heal routinely with return to some sport within 6 to 8 weeks but with FNSF there is often a time delay of up to 50%.

The rate of resumption of activity should be influenced by symptoms and physical findings. When free of pain, the aggravating activity can be resumed and slowly increased. Alternate training options include cycling, swimming (without kicking in the initial phase), upper body weights and water running further. Return to running through graduated walk / jog program is the key. When upgrading the volume should not be increased by more than 10% per week. *This will be expanded in a subsequent article.*

Some FNSFs develop delayed union or non-union. Most non-displaced compression type stress fractures can be treated non-operatively with protected weight-bearing and frequent radiographic follow-up. Traction / tension type stress fractures may require internal fixation as fracture displacement may occur.⁶ If the fracture is bicortical, it may displace and require immediate surgery. Delayed detection may precipitate femoral non-union or avascular necrosis, resulting in long-term functional deficit.⁷

Three Key Points

1. Stress fractures to the neck of femur are often nasty.
2. History and physical examination need to be performed carefully with imaging (usually X-ray and MRI scan) in most patients.
3. Tension side (lateral) may displace requiring immediate surgical management.

¹ Med Sci Sports Exerc. 2011 May 4. [Epub ahead of print] Bone Quality and Muscle Strength in Female Athletes with Lower Limb Stress Fractures. Schnackenburg KE, Macdonald HM, Ferber R, Wiley JP, Boyd SK.

² Med Sci Sports Exerc. 2011 May 4. [Epub ahead of print] Bone Quality and Muscle Strength in Female Athletes with Lower Limb Stress Fractures. Schnackenburg KE, Macdonald HM, Ferber R, Wiley JP, Boyd SK.

³ J Arthroplasty. 2009 Feb;24(2):322.e1-4. Epub 2008 Apr 10.

Spontaneous bilateral femoral neck fractures associated with a low serum level of vitamin D in a young adult. Nagao S, Ito K, Nakamura I.

⁴ Sports Med. 1990 Mar;9(3):192-7. Femoral neck stress fractures. Fullerton LR Jr.

⁵ Femoral Neck Stress Fracture Author: Scott D Flinn, MD; Chief Editor: Sherwin SW Ho, MD
<http://emedicine.medscape.com/article/86568-overview>

⁶ Clin Orthop Relat Res. 1998 Mar;(348):72-8. Stress fractures of the femoral neck. Egol KA, Koval KJ, Kummer F, Frankel VH.

⁷ Sports Med. 1990 Mar;9(3):192-7. Femoral neck stress fractures. Fullerton LR Jr.

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